بسم الله الرحمن الرحيم

عنوان المحاضرة: Hypertension in Pregnancy
تاريخ المحاضرة : 28/3/2013 – 4/4/2013
المحاضر :د. نيفين نور الدين

Introduction:

-Hypertension is one of the most common complications of pregnancy, and is a common cause of fetal and maternal morbidity and mortality.
-Hypertensive diseases are the 2nd most common cause of maternal mortality in Egypt (*1st→Bleeding*)
-It was called (Pregnancy Toxemia) as it's thought that it occurs due to toxins

Definition:

A rise of 30 mmHg or more in systolic blood pressure, or a rise of 15 mmHg or more in diastolic blood pressure above the *base line pressure* or prepregnancy blood pressure,
or a systolic blood pressure of 140 mmHg or more, or diastolic pressure of 90 mmHg or more.

-The alterations of blood pressure should be observed for at least two different occasions 6 hours apart.
-BP should be measured in sitting or semi-sitting position (as uterus compression in supine position → ***Supine Hypotension Syndrome:*** i.e. pressure on IVC → ↓ COP)

-Preeclampsia is a TRIAD of: 1-Hypertension 2-Proteinuria 3-Edema
*__*Proteinuria:*__ Total excretion of 300 mg or more of protein in 24 hour urine collection.

Classification:

Chronic Hypertension	•BP≥140 mmHg systolic or 90 mmHg diastolic prior to pregnancy or before 20 weeks gestation •Persists >12 weeks postpartum
Preeclampsia	•Occurs *DENOVO* •(BP ≥ 140 mm Hg systolic or 90 mm Hg diastolic + proteinuria (>300 mg/24 hr) after 20 weeks gestation + Edema)
Eclampsia	•Preeclampsia + Seizures
Chronic Hypertension With Superimposed Preeclampsia	•Chronic hypertension patients that develop Edema & Proteinuria after 20 wks
Gestational Hypertension	•Hypertension without proteinuria occurring after 20 weeks' gestation •Temporary diagnosis (only during pregnancy)

Preeclampsia

Definition: Specific disease of pregnancy that occurs only in the human female. It is characterized by hypertension, proteinuria and edema.

Predisposing factors:

1-Black races & Middle East 3-Cold weather (due to vasoconstriction)
4-Extremes of age (i.e. pregnancy below 20 and above 35 years) 5-Primigravida
7-Low protein diet, low Calcium supplement, iron deficiency and vitamin B deficiency
8-Maternal medical factors: (Essential hypertension, DM, obesity and chronic nephritis, thrombophilia)
9-Enlarged placental insertion (e.g. Hydatiform mole, hydramnios, multiple pregnancy & hydrops fetalis)

Etiology:

1-Immunologic Theory:

PET is probably immunologic in origin. This is supported by the increased incidence in young patients, (limited antigen exposure), increased fetal antigens (twins, molar pregnancy and diabetes).

2-Prostaglandin theory:

-Two important substances are involved: -Thromboxane-A2 → vasoconstrictive
-Prostacyclin → vasodilator

-Through the cyclo-oxygenase pathway: there is ***stimulation of thromboxane A2***, while there is ***inhibition of the vasodilator material prostacyclin*** under the influence of lipo-oxygenase pathway. The end result is vasoconstriction. For this reason **low dose aspirin** is used to prevent PET.

3-Inadequate Trophoblastic Invasion:

-In the first half of pregnancy trophoblast invades spiral arterioles converting them to low resistance conduits for excess maternal blood flow to the placenta.

-If this is inadequate it will lead to decrease blood flow and hypertension may be compensation for this.

4-Coagulation disturbance:

-Placenta may release thromboplastin which causes DIC so lead to fibrin deposition in the kidney so development of hypertension and placental insufficiency.

Pathogenesis: للفهم

1-Generalized vasospasm all over the body:

-Due to decrease prostacyclin and nitrous oxide

-Due to increased pressor response to angiotensin II associated with decrease of the blood volume due to shift of fluid from intravascular to extra cellular compartment resulting in hemoconcentration, decrease plasma volume and increased hematocrit value due to plasma loss.

Diuretics are **FORBIDDEN

2-Endothelial dysfunction:

-Widespread disturbance of the maternal vascular endothelium is responsible for hypertension, altered vascular reactivity, activation of coagulation cascade and the multi-system damage that accompany PIH.

3-Coagulation abnormalities:

-Hypercoagulability is a feature of normal pregnancy and is further increased in PIH(decrease plasma volume). The principle changes that occur include:

●Increased fibrin production ●Decreased fibrinolytic activity. ●Increased fibrin and platelet deposition. ●Increased factor VIII, factor VIII related antigen and fibrin degradation product in plasma.

-Thrombocytopenia is seen particularly in severe cases mainly secondary to endothelial damage.

-The most important hematologic complication of PET is well known as **HELLP syndrome** (**H**emolysis, **E**levated **L**iver Enzymes, and **L**ow **P**latelet Count).

Pathologic anatomy:

The common pathological feature in PET is **vascular endothelial damage** and dysfunction. There is edema, hemorrhage and necrosis in many organs of the body:

1-The Kidney:

-Glomerular capillary endotheliosis is the most pathognomonic renal changes in PET. The lesion is confined to the glomeruli and their vessels.

-Sodium and water retention, increased serum uric acid due to decrease glomerular filtration rate.

2-The Liver:

The liver is enlarged and tender. It shows hemorrhage, necrosis and fatty degeneration with thrombosis of the intralobular vessels, periportal necrosis and subcapsular haematoma.

3-The Uterus:

-Edema, necrosis of the myometrium with hemorrhage resulting in what is called **(Couvelaire Uterus).**

Couvelaire Uterus → doesn't respond to any Uterotonics

4-Fundus Occuli:

-Papilledema, bleeding of retinal vessel, albuminic retinitis and retinal detachment.

-The prognosis is good and these changes usually disappear within two days to two months.

5-The Heart:

-Subendocardial hemorrhage, fatty degeneration, and the cardiac vasculature show thrombosis, fibrinoid deposition and patchy necrosis.

6-The lungs: picture of acute pulmonary edema

7-The placenta and uteroplacental bed:
-Multiple placental infarcts of the decidual vessels. The functional results of these changes being reduced flow and predisposition to occlusive thrombosis and vessel rupture → IUGR, IUFD
8-Cerebral lesion: **Vasospasm and edema → Cause of severe headache in severe cases**

Clinical Picture:

"PET is the disease of signs meaning that when the symptoms appear the case will be severe"

A) Symptoms

1) Edema: Occurs early and due to sodium retention, increase capillary permeability and decreased osmotic pressure due to decreased plasma protein. It involves the whole lower limb, sacrum, lower abdomen, puffiness, edema of the fingers الخواتم بتضيق عليها

***Occult edema:* fluids are in the internal organs, patient weight ↑ rapidly (e.g. 1 kg per week)**

****Normally patient weight ↑ by 1¾ kg per month & 11½ kg through the whole pregnancy***

2) Headache: It is due to cerebral edema. The pain is frontal or occipital; it becomes intense before convulsions and may be associated with vomiting

3) Epigastric pain: occurs in severe cases due to hepatic congestion and subcapsular hematoma with pressure of the liver capsule it indicates imminent eclampsia. *It isn't relieved by Antacids*

***Triad of imminent eclampsia:* 1-Headache 2-Blurring of vision 3-Epigastric pain**

-لما تسمع من المريضة التلاتة دول في الـHistory تبقى خايف ومتوقع الـFits تحصل في أي لحظة

4) Visual symptoms (Scotoma): transient perception of bright or black spots may progress in severe cases to complete blindness.

5) Brisk deep tendon reflex: due to CNS irritability, twitching of fingers or clonus may occur.

6) Oligouria: due to renal failure

B) Signs:

"Hypertension is the first detected sign and may be associated with excessive weight gain even though clinical evidence of edema is lacking. Proteinuria is the last of the triad to appear"

1) Hypertension: -Mild PET: diastolic BP 90-100 mmHg, Systolic BP 140 mmHg & not reach 160 mmHg
-Severe PET: diastolic BP > 110 mmHg, Systolic BP 160 mmHg

Precautions while measuring the blood pressure:

- **Appropriate cuff should be used to guard against abnormal high reading.**
- **Evaluation of the blood pressure should be in setting or semi setting position.**
- **Muffling (Kortokoff IV sound is the best marker of diastolic BP in hyperdynamic circulation)**

2) Fluid retention, Edema and Weight gain:

-Normally weight ↑ by 1¾ kg per month & 11½ kg through the whole pregnancy

****Occult edema: fluids are in the internal organs, patient weight ↑ rapidly (e.g. 1 kg per week)***

3) Proteinuria:

It is the latest sign. It is characterized by being non-selective including different proteins with variable molecular weights. It is the 1st clinical indicator of severity as it is easily assessed by dipsticks

Tests for proteinuria:

- ***Boiling:* precipitate occurs on boiling that does not disappear on adding acetic acid.**
- ***Albiostix dipsticks:* a change of color depends on protein concentration**

-Mild proteinuria → 1+ dipstick (500 mg/24 hrs) -Severe proteinuria → 2+ dipstick (1000 mg/24 hrs)

► *5 g/ 24 hrs → Very severe & necessitates Termination*

N.B.:

1- Progression may be slow or rapid (fulminant) – hours to days to weeks.
2- Antinatal care is VERY IMPORTANT esp. in High Risk group
3- For clinical management, preeclampsia should be overdiagnosed to prevent maternal and perinatal morbidity and mortality.

Indicators of Severe PreecImpsia:

A) Clinical

1-Persistent headache or other cerebral or visual disturbances

2-Persistent epigastric pain **3-Oligouria less than or equal to 400 ml in 24 hours**

B) Lab

1-SBP > 160 mm Hg or DBP > 110 mm Hg **2-Proteinuria > 5.0 g in 24 hours (2+ or 3+ dipstick)**

3-Increased serum creatinine **4-Platelet count < 100,000 cells/mm^3**

5-Elevated ALT or AST

Complications of Preeclampsia:

1-Eclampsia **2-HELLP syndrome** **3-Pulmonary edema** **4-Electrolyte imbalance**

5-Post-partum Hge **6-Acute renal failure** **7-Hepatic rupture** **8-Abruptio placenta**

9-Cerebral Hge **10-Visual disturbance**

Prevention:

"Although antenatal care has not been shown to prevent mild PET however it reduces the incidence of severe disease and improves the perinatal outcome"

I-Prediction of Preeclampsia:

A-Identification of high risk groups

B-Proper antenatal care and BP measurement

C-Tests used for prediction of preeclampsia:

1) **Average 2nd trimester mean arterial blood pressure (increase by 5 mmHg or more increase the incidence of occurrence of pre eclampsia 4 folds)**
2) ***Roll over test:* done 28-32 weeks by measuring the blood pressure in the *lateral recumbent position* then the patient is rolled flat *on her back* and blood pressure is then measured if diastolic blood pressure *rises by 20 mmHg* or more this indicate high incidence for development of preeclampsia**
3) **Doppler U/S: done at 18-24 weeks for umbilical and uterine arteries to determine any abnormality of the uteroplacental blood flow**
4) **Urinary calcium: urinary calcium ≤ 12 gm/dl in 24 h urine has an 85-91% positive predictive value.**
5) **Fibronectin: is a glycoprotein that has an important role in cellular adhesion; its increased level precedes the clinical sings of preeclampsia**

II-Methods of Prevention:

1-Low dose Aspirin: 60-150 mg /day seems to be preventing PET and should be used in patients at risk for this disease for preferential inhibition of thromboxane A2 production.

2-Others

-Ca supplementation: 600 mg /day used from 15 weeks of gestation to decrease the incidence of PET

-Fish Oils **-Antioxidants**

Management of Preeclampsia: **(Click Here to See FLOWCHARTs)**

General Measures:

1) Education of patient: -Symptoms to report -Number or person to call -When to call ambulance

2) Education of office personnel **3) Communication with partners/associates**

A) Gestational Hypertension & Mild Preeclampsia: "Follow-up & Good Antenatal Care"

►*Fetal Evaluation:*

-At time of diagnosis: 1-EFW (Estimated Fetal Weight) and AF (Amniotic Fluid) status

2-NST (Non Stress Test) 3-BPP (Biophysical Profile) if non-reactive NST

-Evaluation of fetal growth every 3 wks

-Weekly NST or BPP

-More frequent if EFW < 10th percentile or AFI < 5

-Repeat immediately if change in maternal condition

►***After Fetal & Maternal Evaluation:***

1-If > 37 wks

Or If < 37 wks but: - Non-compliant patient -Abnormal fetal testing → DELIVERY

- Intrauterine growth restriction - Rupture of membrane

2-If < 37 wks without previous conditions → wait till 37 wks with:

-Serial Maternal/Fetal evaluation -Inpatient (Hospitalization) or outpatient management

B) Severe Preeclampsia (Eclampsia)

►***Indications for Hospitalization:***

1-Severe preeclampsia 2-Hypertension plus symptoms 3-Noncompliant patient

4-SBP > 150 or DBP > 100 mmHg 5-Proteinuria > 2 + (1 g/24 hr) 6-Evidence of IUGR

►***Indications for Delivery in Preeclampsia:***

A) Maternal

1-GA > 38 weeks 2-Platelets < 100,000 / mm^3

3-Progressive deterioration in hepatic/renal function

4-Suspected abruptio placentae 5-Severe headaches/visual changes

6-Severe epigastric pain, nausea or vomiting

B) Fetal

1-Severe FGR 2-Nonreassuring fetal testing 3-Oligohydramnios

Protocol for expectant management classically: "Stabilize and Deliver"

►**Medical management while awaiting delivery:**

1-Hospitalisation and bed rest 2-Antihypertensive treatment

3-Dexamethasone: 8 mg / 8hours three doses → to enhance lung maturity

4-Investigations: renal, hepatic, hematologic … 5-Daily NST and fetal movement count

6-Ultrasonography every week 7-Observation for symptoms of imminent eclampsia

►**Maternal observation for:**

1-Abnormal symptoms as headache, epigastric pain, blurring of vision and vomiting

2-Vital signs every 6 hours 3-Weight every other day 4-Urine analysis for proteinuria every day

5-Creatinine clearance every week 6-Blood chemistry: urea, creatinine, and uric acid

7-Liver function tests 8-Coagulation profile 9-Ophthalmoscope 10-Blood glucose

►**TREATMENT →**

A-DELIVERY (in High-risk pregnancy unit / Tertiary hospital / Well equiped hospital)

1) Induction with Oxytocin: **-after 36 weeks (with Application of forceps / ventouse)**

If: -Fetal condition is good -Cervix is favourable / cerviprime

2) By LSCS (Lower segment Cesarean section): **-Before 36 weeks**

In cases of maternal / fatal jeopardy (with Epidural / Spinal Anesthesia)

B-POSTPARTUM

1) *Hemorrhage*: - Be prepared to face it (due to Uterine Atony / DIC / Thrombocytopenia /Aspirin)

-Oxytocics -Uterine massage -Packing -Uterine Artery Ligation

-Internal iliac artery ligation -Hysterectomy

2) *Neonatal Care:* **-Presence of paeditrician is a must -Incubator is helpful**

3) *Drugs:* **WISE use of Antihypertensives, IV fluids, Diuretics & diazepam in the first 48 hours**

4) *Follow-up for 6 weeks*

***Antihypertensives:**

(They are used for BP readings of 160 systolic or 110 diastolic or higher)

1-α MethylDOPA: Drug of Choice, Acts centrally, Dose: Oral 250 mg 3 or 4 time daily

2-Nifidepine: calcium channel blocker, SE: Tachycardia and sudden fall in BP (Placental Insufficiency)

3-Labetalol 4-Hydralazine

****Methergine is CONTRAINDICATED (Cause vasoconstriction)**

Eclampsia

Definition:

It is an extremely severe of preeclampsia characterized by onset of generalized tonic-clonic seizures

Incidence: 0.2-0.5% of all deliveries

Types: According to time of occurrence of fits:

-Antepartum (46%) -Intrapartum (16.4%) -Postpartum (37.3)

Clinical features:

1-Prodromal stages (imminent eclampsia): There is severe headache, epigastria pain, blurring vision.

2-Premonitory stage: Facial muscle twitches, the eyes roles up to expose sclera.

3-Tonic stage: The whole body becomes rigid cyanosed due to respiratory muscle spasm.

4-Clonic stage: All the muscles of body contract and relaxed in rapid sequalae.the patient may bit her tongue or throw her out of the bed.

5-Coma stage: After convulsions there is increase in body temperature and respiratory rate and patient is unconscious.

Management of Eclampsia: (Click Here to see Flowchart)

1-Emergency treatment and first aid 2-Control of convulsions 3-Correction of hypoxia & acidosis

4-Control of BP 5-Delivery: in 6 hours after control of fits

**Emergency & First Aid:

1-Clear airway by airway and suction 2-Oxygen to correct hypoxia 3-Catheter

4-IV lines (2 wide bore cannula) 5-Never leave alone 6-Dark and quiet room & Beds with padded sides

7-BP, Pulse, and Respiratory rates/30 mint 8-investigation (Urine, CBC,....)

**Anticonvulsants: (Magnesium sulphate – Diazepam - Phenytoin - Other agents)

►Magnesium Sulphate: (used in eclampsia and imminent eclampsia)

-Anticonvulsant of choice in eclampsia -Does not depress the maternal CNS -The fetus is least affected

Protocol: (Q)

a) 4 gms IV as 20% soln @ 1 gm/min loading b) 10 gms of 50% soln. 5 gms in each buttock

c) If convulsions persist after 15 min give 2 gms IV again as 20 % soln

d) Every 4 hours 5 gms of 50% soln given in alternate buttock Or

1-2gms IV slowly /4-6 hours after loading dose

e) Discontinued 24 hours after delivery or after last fit

f) If Mg levels are monitored it must be between 4 -7 mEq/L

g) If clinical monitoring only:

-The patellar reflex must be present -Respiration not depressed

-Urine output > 100 mL in the last 4 hours

h) If monitoring indicates overdose→ Stop ttt & use Antidote (Calcium Gluconate)

Maternal Complications:

A) Central nervous system:

1-Eclamptic convulsions 2-Cerebral hemorrhage 3-Cerebral edema

4-Cortical blindness 5-Retinal detachment

B) Renal:

1-Cortical necrosis 2-Tubular necrosis

C) Liver:

1-Jaundice 2-HELLP 3-Hepatic rupture

D) Coagulation:

1-DIC 2-Microangiopathic hemolysis 3-HELLP

HELLP Syndrome:

Criteria:

1-Hemolysis: Severe Anemia, unrelated to blood loss
2-Elevated Liver enzymes: AST or ALT ≥ twice upper level or normal
3-Low Platelets: (<100,000/mm^3)

Complaint:

1-Epigastric pain 2-Nausea or vomiting 3-HeadacheVisual changes 4-Bleeding
5-Jaundice 6-Shoulder or neck pain 7-Diarrhea

Management: (See Flowchart)

1-Refer to tertiary care facility 2-IV magnesium sulfate 3-Antihypertensives
4-Complete steroid course (↓Hemolysis) 5-Blood Transfusion 6-DELIVERY
7-Postpartum Care: -After delivery there is usually rapid improvement but eclampsia can appear for the first time or persist postpartum
-The women is discharged if severe HTN has abated or no fit has occurred for 48 hours
8-Future Counseling: -There is a higher risk of PIH recurring in subsequent pregnancy
-There is also a higher risk of developing chronic hypertension

---

Chronic Hypertension in Pregnancy:

****Hypertension before 20 week without proteinuria (if there is proteinuria → Renal cause)**

Prepregnancy counseling: √√√√

1-Evaluate 2-Discontinue use of ACE inhibitors
3-Evaluate for target organ damage in women with longstanding hypertension
4-Discontinue use of tobacco and/or alcohol, even if not hypertensive
5-Discuss lifestyle changes, if applicable

Etiology: 1-Essential hypertension
2-Secondary hypertension: to renal, endocrine, cardiovasular diseases.

Effect of pregnancy on chronic hypertension:

1-Hypertension may appear for first time during pregnancy.
2-The blood pressure may drop during the 2nd trimester due to decreased peripheral vascular resistance, and then the blood pressure rises again in 3rd trimester.

Effect of chronic hypertension on pregnancy:

1-Superimposed preeclampsia:
occurs approximately in 30 % of cases associated with proteinuria, occurs usually in Grand Multigravida
2-Intrauterine growth restriction:
Affects 15-25% of pregnancies, there is increased incidence of preterm labor and placental abruption
3-Preterm labor: 15% of the cases 4-Placental abruption: 5-9% of the cases

Management:

A) General:

1-Bed rest 2-Salt and coffee restriction 3-Weight reduction
4-Exercise: continue any exercise program initiated before pregnancy but do not begin a new exercise.
5-Blood pressure monitoring: of fundamental importance in the management of chronic hypertension during pregnancy
6-Most women with mild hypertension are candidates for non-drug therapy, absent evidence of target organ damage.
7-Most of the increased risk associated with chronic HTN occurs with superimposed preeclampsia.
8-End points for reinstituting treatment include SBP > 150-160 or DBP > 100-110 or evidence of target organ damage.

B) Antihypertensive Drugs:

****ACEIs are contraindicated in pregnancy.**

1-Methyldopa preferred first-line therapy; labetalol if methyldopa not tolerated

2-Diuretics not used as first-line agents but are not contraindicated (cause DVT) except in cases of reduced uteroplacental perfusion

C) Fetal Assessment:

1-Early detection of superimposed preeclampsia and possible fetal growth restriction

2-Initial sonogram at 18 to 20 weeks gestation

3-Fetal growth carefully assessed thereafter

4-If growth restriction, assess by nonstress tests or biophysical profiles

D) Delivery: Indications

I) Maternal

1-Gestational age ≥38 weeks **2-Platelet count <100,000 cells/mm^3**

3-Deterioration in hepatic or renal function **4-Suspected placental abruption**

5-Severe headache or visual changes **6-Severe epigastric pain, nausea or vomiting**

II) Fetal

1-Severe fetal growth restriction **2-Concerning fetal testing results** **3-Oligohydramnios**

E) Postpartum:

1-Taper medication dosage **2-Selection of safe medications** **3-Close monitoring for adverse effects**

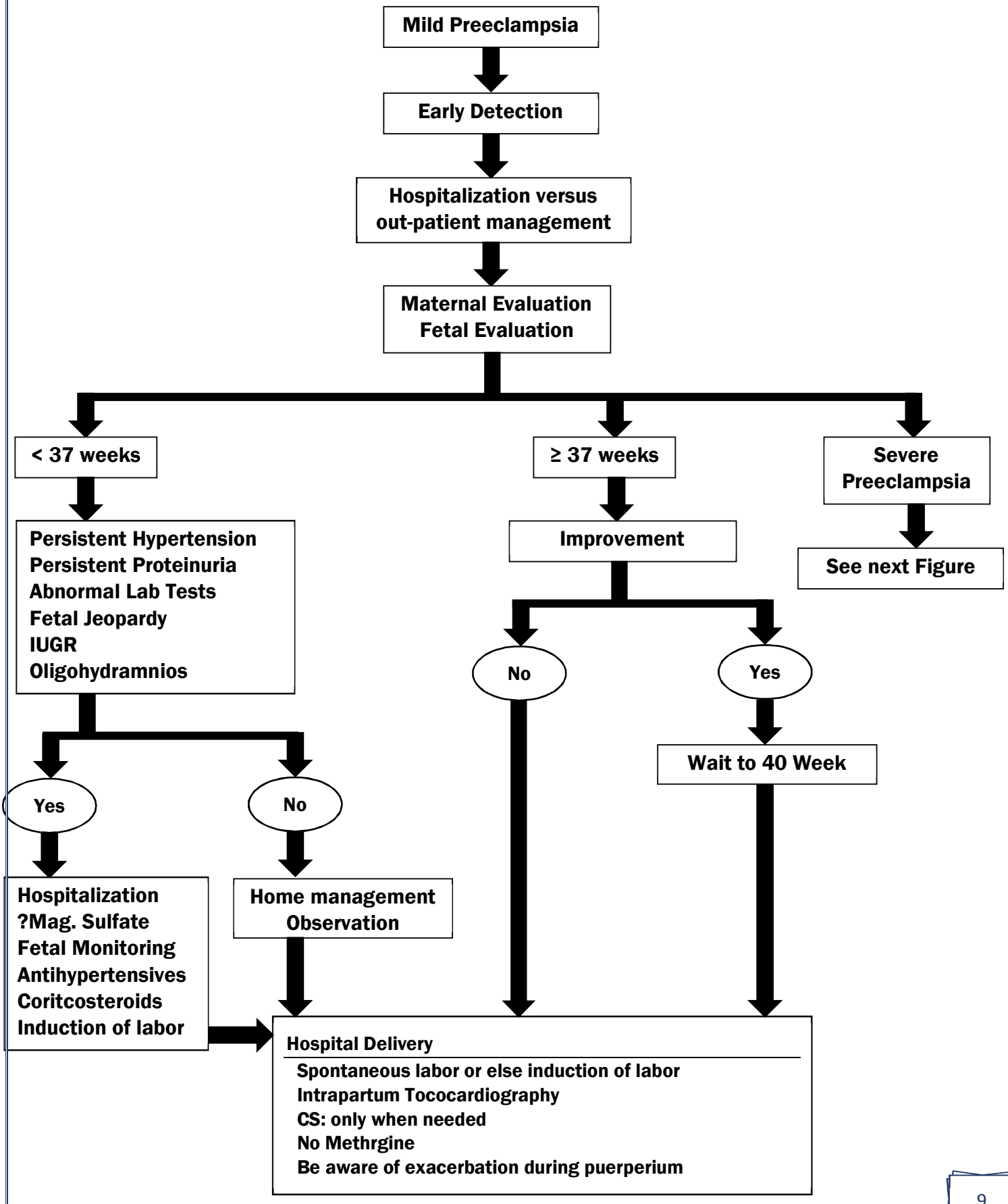
F) Long Term Risk:

-Monitor blood pressure for future hypertension

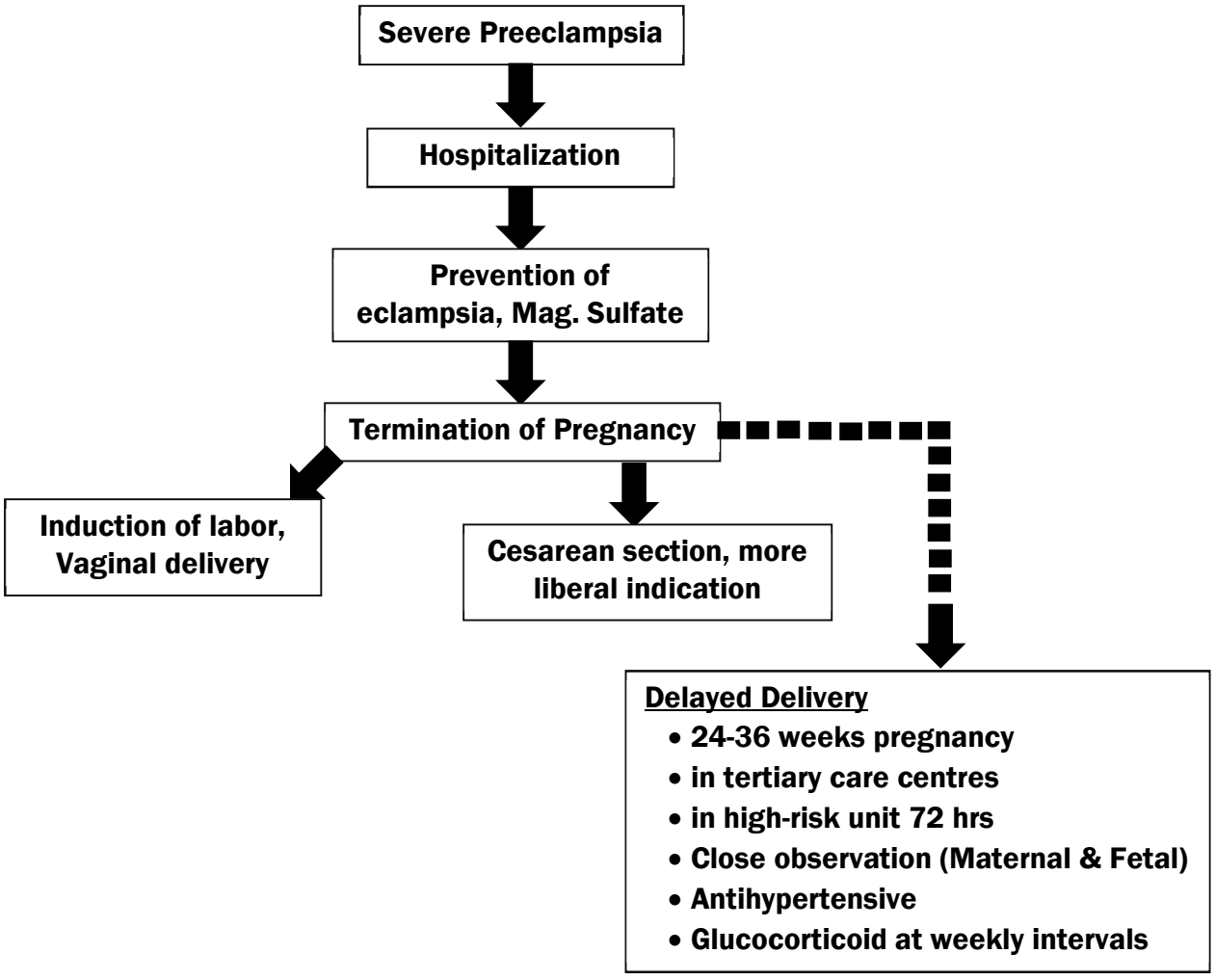
-Treat cardiovascular risk factors **-Postpone further pregnancies**

Flowcharts of Hypertension in Pregnancy

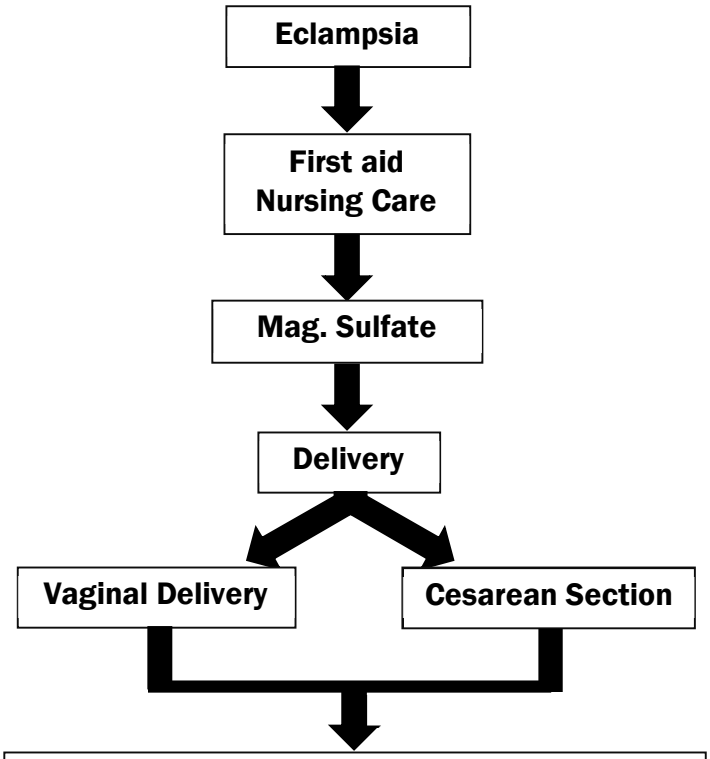
1) Management of Mild Preeclampsia



2) Management of Severe Preeclampsia:



3) Management of Eclampsia:



Treatment of complications:

- Respiratory distress/Aspiration Pneumonia
- Heart Failure
- Abruptio placentae
- Hypovolemic shock
- Intractanial Hemorrhage
- Acute renal failure
- Consumptive coagulopathy
- ?HELLP Syndrome

4) Management of HELLP syndrome: